

HUMAN RESPONSES TO CHANGING COASTAL SYSTEMS

During the 20th century, human development and engineering have become a dominant force in modifying barrier island evolution. Among these modifications are the construction of bridges, roads, and barrier dune ridges, beach management (e.g., hardening, sand bags, and nourishment), and inlet management (e.g., closing, hardening, and sand mining/dredging). All of these anthropogenic processes interrupt the natural barrier island dynamics.

Infrastructure Construction

Roads and Bridges

During the 20th century, highways and bridges were built to facilitate development of the Outer Banks. NC Highway 12 was paved in 1952 and connected to the 2.44 mile long Oregon Inlet bridge constructed in 1962-63. These structures were built across Cape Hatteras National Seashore and Pea Island National Wildlife Refuge to connect eight isolated villages with the Kitty Hawk to Nags Head urban area to the north.

Oregon Inlet was opened by a hurricane in 1846 north of the current Bodie Island lighthouse. It had migrated 2.5 miles southward by 1989. Construction of a bridge with a fixed navigational span over a migrating inlet required immediate dredging to keep the main channel under the fixed span. The amount of dredging required to hold the channel increased through time. By 1980 the problem became severe enough to require a substantial increase in the volume and frequency of dredging. The dredged sand was dumped offshore in deep water and lost to the inlet-barrier island system. This resulted in increased rates of inlet migration and beach erosion on Pea Island. As the inlet migrated southward, the bridge was becoming severed from Pea Island.

When the inlet approached the old U.S. Coast Guard Station, a variance was received from the NCCRC to stop inlet migration by constructing a rock jetty and to build an extensive rock revetment around the northern end of Pea Island to secure it to the bridge (Fig. 14). The jetty and revetment were built in 1989-1991 and did stop the southward migration of the inlet. In the meantime,

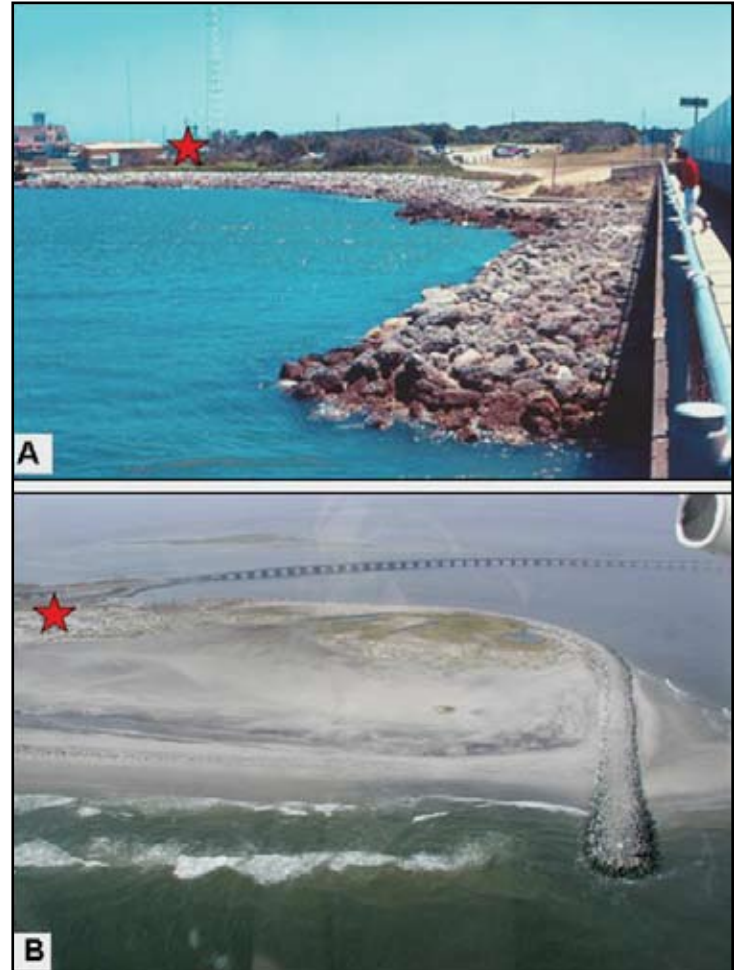


FIGURE 14. Photographs of the Oregon Inlet bridge with a rock revetment built in 1989 around the south end of the bridge to secure it to Pea Island (Panel A) and a jetty built in 1989-91 to stabilize the south shore of the migrating inlet (Panel B). The red star shows the location of the former U.S. Coast Guard Station. Photographs are by S. Riggs.

however, the northern side of the inlet continued to migrate southward, thus narrowing the inlet width and substantially deepening the navigational channel under the fixed bridge span. This, in turn, jeopardized the central bridge piles and rock fill was required to rebury the piles.

With construction of the jetty, it was determined that the down-drift Pea Island beach should be nourished with sand obtained from inlet dredging. Approximately 7.7 million yards³ of inlet sand were pumped onto the beach and placed in shallow, near-shore waters of Pea Island during 23 operations between 1989 and 2005. In addition, about